AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An X-ray exposure apparatus comprising:

two X-ray mirrors containing a material having an absorption edge only in a range of a wavelength other than 0.45 nm through 0.7 nm for X-rays,

said X-ray mirrors receiving an X-ray having an angle of oblique incidence of no more than 1.5°, wherein

an X-ray received by said X-ray mirrors is ~~outputted~~ output from an X-ray source having a first angle and a second angle, wherein the first angle is greater than the second angle,

a first of said X-ray mirrors collects the X-ray in a direction in which the X-ray is outputted at the first angle, and

a second of said X-ray mirrors increases an area of a region illuminable by X-rays outgoing from said X-ray mirrors in a direction in which the X-ray is outputted at the second angle, and

said two X-ray mirrors absorb at least 90% of an X-ray having a frequency range less than 0.3 nm.

2. (Original) The X-ray exposure apparatus according to claim 1, wherein said X-rays are included in radiation outgoing from a synchrotron radiation source.

Claim 3. (Cancelled)

4. (Currently Amended) The X-ray exposure apparatus according to claim 1, wherein said X-ray mirrors contain a single type of mirror material selected from a group consisting of beryllium, titanium, silver, ruthenium, rhodium, and palladium, nitrides, carbides, and borides of these, diamond, diamond-like carbon, and boron nitride.

Claims 5-10. (Cancelled)

11. (Currently Amended) The X-ray exposure apparatus according to claim 1 further comprising an X-ray mask, wherein said X-ray mask includes a membrane and an X-ray absorber formed on said membrane, and

said membrane contains a single species selected from a group consisting of diamond, diamond-like carbon, boron nitride, and beryllium.

12. (Original) The X-ray exposure apparatus according to claim 1 further comprising an X-ray mask, wherein said X-ray mask includes a membrane and an X-ray absorber formed on said membrane,

said membrane contains a material having an absorption edge only in at least either one of a wavelength region of less than 0.45 nm and a wavelength region exceeding 0.7 nm as to X-rays, and

said X-ray absorber contains a material having an absorption edge in a wavelength region of at least 0.6 nm and less than 0.85 nm.

Claims 13-23. (Cancelled)

24. (Currently Amended) An X-ray exposure method comprising:

an X-ray incidence step of making X-rays incident upon two X-ray mirrors containing a material having an absorption edge only in a range of wavelength other than 0.45 nm through 0.7 nm for X-rays, said X-ray mirrors receiving an X-ray having an angle of oblique incidence [[on]] of no more than 1.5°; wherein

an X-ray received by said X-ray mirrors is ~~outputted~~ output from an X-ray source having a first angle and a second angle, wherein the first angle is greater than the second angle,

a first of said X-ray mirrors collects the X-ray in a direction in which the X-ray is outputted at the first angle, and

a second of said X-ray mirrors increases an area of a region illuminable by X-rays outgoing from said X-ray mirrors in a direction in which the X-ray is outputted at the second angle, and

said two X-ray mirrors absorb at least 90% of an X-ray having a frequency range less than 0.3 nm.

25. (Original) The X-ray exposure method according to claim 24, further comprising an X-ray outgoing step of making said X-rays outgo from a synchrotron radiation source.

Claim 26. (Cancelled)

27. (Currently Amended) The X-ray exposure method according to claim 24, wherein said X-ray mirrors contain a single type of mirror material selected from a group consisting of beryllium, titanium, silver, ruthenium, rhodium, and palladium, nitrides, carbides, and borides of these, diamond, diamond-like carbon, and boron nitride.

Claims 28-33. (Cancelled)

34. (Currently Amended) The X-ray exposure method according to claim 24, further employing an X-ray mask, wherein said X-ray mask includes a membrane and an X-ray absorber formed on said membrane, and

said membrane contains a single species selected from a group consisting of diamond, diamond-like carbon, boron nitride, and beryllium.

35. (Currently Amended) The X-ray exposure method according to claim 24, further employing an X-ray mask, wherein said X-ray mask includes a membrane and an X-ray absorber formed on said membrane,

said membrane contains a material having an absorption edge only in at least either one of a wavelength region of less than 0.45 nm and a wavelength region exceeding 0.7 nm as to X-rays, and

said X-ray absorber contains a material having an absorption edge in a wavelength region of at least 0.6 nm and less than 0.85 nm.

Claims 36-39. (Cancelled)

40. (Currently Amended) A synchrotron radiation apparatus comprising a synchrotron radiation source and two X-ray mirrors upon which radiation outgoing from said synchrotron radiation source is incident,

said two X-ray mirrors containing a material having an absorption edge only in a range of wavelength other than 0.45 nm through 0.7 nm for X-rays, and receiving an X-ray having an angle of oblique incidence of no more than 1.5°, wherein

an X-ray received by said X-ray mirrors is outputted from said synchrotron radiation source having a first angle and a second angle, wherein the first angle is greater than the second angle,

a first of said X-ray mirrors collects the X-ray in a direction in which the X-ray is outputted at the first angle, ~~and~~

a second of said X-ray mirrors increases an area of a region illuminable by X-rays outgoing from said X-ray mirrors in a direction in which the X-ray is outputted at the second angle, and

said two X-ray mirrors absorb at least 90% of an X-ray having a frequency range less than 0.3 nm.

Claim 41. (Cancelled)

42. (Currently Amended) A synchrotron radiation method employing a synchrotron radiation apparatus including a synchrotron radiation source and two X-ray mirrors upon which radiation outgoing from said synchrotron radiation source is incident, said two X-ray mirrors

containing a material having an absorption edge only in a range of a wavelength other than 0.45 nm through 0.7 nm for X-rays, the method comprising:

a radiation incidence step of making incident upon said two X-ray mirrors an X-ray outgoing from the synchrotron radiation source and having an angle of oblique incidence of no more than 1.5°; and

an exposure step of performing exposure with X-rays outgoing from said X-ray mirrors, wherein

an X-ray received by said X-ray mirrors is outputted from said synchrotron radiation source having a first angle and a second angle, wherein the first angle is greater than the second angle,

a first of said X-ray mirrors collects the X-ray in a direction in which the X-ray is outputted at the first angle, ~~and~~

a second of said X-ray mirrors increases an area of a region illuminable by X-rays outgoing from said X-ray mirrors in a direction in which the X-ray is outputted at the second angle, and

said two X-ray mirrors absorb at least 90% of an X-ray having a frequency range less than 0.3 nm.

Claims 43-49. (Cancelled)

50. (Currently Amended) An X-ray exposure apparatus, comprising:

a first stage X-ray mirror, and

a second stage X-ray mirror, wherein

α represents an angle of oblique incidence of an X-ray incident on said first stage X-ray mirror and said second stage X-ray mirror,

L<u>α</u> represents a distance between said first and second stage X-ray mirrors, as seen along an x-axis corresponding to a direction of the X-ray incident on said first stage X-ray mirror<u>, Lα has a same direction of an optical axis of the X-ray incident on said first stage X-ray mirror,</u>

D represents a distance from incidence of an optical axis of the X-ray incident on said first stage X-ray mirror to said second stage X-ray mirror<u>, and has a direction of an axis orthogonal to the optical axis of the X-ray incident on said first stage X-ray mirror and orthogonal to a plane defined by the optical axis of the X-ray incident on said first stage mirror and an X-ray reflected from said first stage mirror</u>, and

said α and L<u>α</u> are changed to satisfy a relationship D = L<u>α</u> x tan (2α), whereby

respective optical axes of X-rays have substantially identical directions, and

a spectral distribution of an X-ray outgoing from said second stage is changed<u>, wherein the direction of the optical axis of the X-ray incident on said first stage X-ray mirror is substantially identical to a direction of the optical axis of the X-ray output from the second stage X-ray mirror</u>.

51. (Currently Amended) An X-ray exposure apparatus. comprising:

a first stage X-ray mirror,

a second stage X-ray mirror, and

a third stage X-ray mirror, wherein

α represents an angle of oblique incidence of an X-ray incident on said first stage X-ray mirror and said third stage X-ray mirror,

2α represents an angle of oblique incidence of an X-ray incident on said second stage X-ray mirror,

L represents a distance between said first and second stage X-ray mirrors and a distance between said second and third stage X-ray mirrors, as seen along an x-axis corresponding to a direction of the X-ray incident on said first stage X-ray mirror, L has a same direction of an optical axis of the X-ray incident on said first stage X-ray mirror,

$D\alpha$ represents a distance from incidence of an optical axis of the X-ray incident on said first stage X-ray mirror to said second stage X-ray mirror, and has a direction of an axis orthogonal to the optical axis of the X-ray incident on said first stage X-ray mirror and orthogonal to a plane defined by the optical axis of the X-ray incident on said first stage mirror and an X-ray reflected from said first stage mirror, and

said α and [[L]] $D\alpha$ are changed to satisfy a relationship $D\alpha = L \times \tan (2\alpha)$, whereby respective optical axes of X-rays have substantially identical directions, and

a spectral distribution of an X-ray outgoing from said third stage is changed, wherein the direction of the optical axis of the X-ray incident on said first stage X-ray mirror is substantially identical to a direction of the optical axis of the X-ray output from the third stage X-ray mirror.

52. (Currently Amended) An X-ray exposure apparatus, comprising:

a first stage X-ray mirror,

a second stage X-ray mirror,

a third stage X-ray mirror, and

a fourth stage X-ray mirror, wherein

α represents an angle of oblique incidence of an X-ray incident on each of said first, second, third, and fourth stage X-ray mirrors,

L represents a distance between said first and second stage X-ray mirrors and a distance between said third and fourth stage X-ray mirrors, as seen along an x-axis corresponding to a direction of the X-ray incident on said first stage X-ray mirror, L has a same direction of an optical axis of the X-ray incident on said first stage X-ray mirror,

$D\alpha$ represents a distance from incidence of an optical axis of the X-ray incident on said first stage X-ray mirror to said third and fourth stage X-ray mirrors, and has a direction of an axis orthogonal to the optical axis of the X-ray incident on said first stage X-ray mirror and orthogonal to a plane defined by the optical axis of the X-ray incident on said first stage mirror and an X-ray reflected from said first stage mirror, and

said α and [[L]] $D\alpha$ are changed to satisfy a relationship $D\alpha = L \times \tan(2\alpha)$, whereby respective optical axes of X-rays have substantially identical directions, and

a spectral distribution of an X-ray outgoing from said fourth stage is changed, wherein the direction of the optical axis of the X-ray incident on said first stage X-ray mirror is substantially identical to a direction of the optical axis of the X-ray output from the fourth stage X-ray mirror.

53. (Currently Amended) An X-ray exposure apparatus, comprising:

a first stage X-ray mirror,

a second stage X-ray mirror,

a third stage X-ray mirror, and

a fourth stage X-ray mirror, wherein

α represents an angle of oblique incidence of an X-ray incident on each of said first and fourth stage X-ray mirrors,

β represents and angle of oblique incidence of an X-ray incident on each of said second and third stage X-ray mirrors,

$L\alpha$ represents a distance between said first and second stage X-ray mirrors and a distance between said third and fourth stage X-ray mirrors, as seen along an x-axis corresponding to a direction of the X-ray incident on said first stage X-ray mirror,

$L\beta$ represents a distance between said second and third stage X-ray mirrors, as seen along said x-axis,

D represents a distance between said second and third stage X-ray mirrors, as seen along a y-axis corresponding to a direction perpendicular to said x-axis, and

said α, β, $L\alpha$ and $L\beta$ are changed to satisfy a relationship $D = 2 \times L\alpha \times \tan(2\alpha) = L\beta \times \tan \underline{2}(\beta - \alpha)$, whereby

respective optical axes of X-rays have substantially identical directions, and

a spectral distribution of an X-ray outgoing from said fourth stage is changed<u>, wherein the direction of the optical axis of the X-ray incident on said first stage X-ray mirror is substantially identical to a direction of the optical axis of the X-ray output from the second stage X-ray mirror</u>.

54. (New) An X-ray exposure method employing an X-ray exposure apparatus including two X-ray mirrors including first and second stage X-ray mirrors, comprising the steps of

changing a spectral distribution, rendering substantially identical a direction of an optical axis of an X-ray incident on said first stage X-ray mirror and a direction of an optical axis of an

X-ray outgoing from said second stage X-ray mirror, and also changing a spectral distribution of the X-ray outgoing from said second stage X-ray mirror, by changing α and L to satisfy a relationship $D = L \times \tan(2\alpha)$, wherein α represents an angle of oblique incidence of an X-ray incident on said first and second stage X-ray mirrors, L represents a distance between said first and second stage X-ray mirrors as seen along an x axis corresponding to a direction of the X-ray incident on said first stage X-ray mirror, and D represents a distance from incidence of an optical axis of the X-ray incident on said first stage X-ray mirror to said second stage X-ray mirror, as seen along a y axis corresponding to a direction perpendicular to said x axis;

causing an X-ray incident on said first stage X-ray mirror; and

exposing to an X-ray outgoing from said first stage X-ray mirror via said second stage X-ray mirror.

55. (New) An X-ray exposure method employing an X-ray exposure apparatus including three X-ray mirrors including first, second and third stage X-ray mirrors, comprising the steps of:

changing a spectral distribution, rendering substantially identical an optical axis of an X-ray incident on said first stage X-ray mirror and an optical axis of an X-ray outgoing from said third stage X-ray mirror, and also changing a spectral distribution of the X-ray outgoing from said third stage X-ray mirror, by changing α and L to satisfy a relationship $D = L \times \tan(2\alpha)$, wherein α represents an angle of oblique incidence of an X-ray incident on said first and third stage X-ray mirrors, 2α represents an angle of oblique incidence of an X-ray incident on said second stage X-ray mirror, L represents a distance between said first and second stage X-ray mirrors and a distance between said second and third stage X-ray mirrors, as seen along an x axis corresponding to a direction of the X-ray incident on said first stage X-ray mirror, and D

represents a distance from incidence of an optical axis of the X-ray incident on said first stage X-ray mirror to said second stage X-ray mirror, as seen along a y axis corresponding to a direction perpendicular to said x axis;

causing an X-ray incident on said first stage X-ray mirror; and

exposing to an X-ray outgoing from said first stage X-ray mirror via said second and third stage X-ray mirrors.

56. (New) An X-ray exposure method employing an X-ray exposure apparatus including four X-ray mirrors including first, second, third and fourth stage X-ray mirrors, comprising the steps of:

changing a spectral distribution, rendering substantially identical an optical axis of an X-ray incident on said first stage X-ray mirror and an optical axis of an X-ray outgoing from said fourth stage X-ray mirror, and also changing a spectral distribution of the X-ray outgoing from said fourth stage X-ray mirror, by changing α and L to satisfy a relationship $D = L \times \tan(2\alpha)$, wherein α represents an angle of oblique incidence of an X-ray incident on each of said four X-ray mirrors, L represents a distance between said first and second stage X-ray mirrors and a distance between said third and fourth stage X-ray mirrors, as seen along an x axis corresponding to a direction of the X-ray incident on said first stage X-ray mirror, and D represents a distance from incidence of an optical axis of the X-ray incident on said first stage X-ray mirror to said third and fourth stage X-ray mirrors, as seen along a y axis corresponding to a direction perpendicular to said x axis;

causing an X-ray incident on said first stage X-ray mirror; and

exposing to an X-ray outgoing from said first stage X-ray mirror via said second to fourth stage X-ray mirrors.

57. (New) An X-ray exposure method employing an X-ray exposure apparatus including four X-ray mirrors including first, second, third and fourth stage X-ray mirrors, comprising the steps of:

changing a spectral distribution, rendering substantially identical an optical axis of an X-ray incident on said first stage X-ray mirror and an optical axis of an X-ray outgoing from said fourth stage X-ray mirror, and also changing a spectral distribution of the X-ray outgoing from said fourth stage X-ray mirror, by changing α, β, $L\alpha$ and $L\beta$ to satisfy a relationship $D = 2 \times L\alpha \times \tan(2\alpha) = L\beta \times \tan2(\beta - \alpha)$, wherein α represents an angle of oblique incidence of an X-ray incident on each of said first and fourth stage X-ray mirrors, β represents an angle of oblique incidence of an X-ray incident on each of said second and third stage X-ray mirrors, $L\alpha$ represents a distance between said first and second stage X-ray mirrors and a distance between said third and fourth stage X-ray mirrors, as seen along an x axis corresponding to a direction of the X-ray incident on said first stage X-ray mirror, $L\beta$ represents a distance between said second and third stage X-ray mirrors, as seen along said x axis, and D represents a distance between said second and third stage X-ray mirrors, as seen along a y axis corresponding to a direction perpendicular to said x axis;

causing an X-ray incident on said first stage X-ray mirror; and

exposing to an X-ray outgoing from said first stage X-ray mirror via said second to fourth stage X-ray mirrors.